REDESCRIPTION OF THE MALE AND REDESIGNATION OF *NEOBISIUM* (*PAROBISIUM*) *PYGMAEUM* (ELLINGSEN) (ARACHNIDA: PSEUDOSCORPIONIDA)

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Synopsis

Kobari, H. (Tsuchiura Daisan Senior High School, 1599 Ooiwata, Tsuchiura, Ibaraki Pref. 300, Japan): Redescription of the male and redesignation of *Neobisium* (*Parobisium*) *pygmaeum* (Ellingsen) (Arachnida: Pseudoscorpionida). *Acta Arachnol.*, **32**: 55-64 (1984).

Five male specimens of *Neobisium* (*Parobisium*) *pygmaeum* (Ellingsen) were collected in northern districts of the Kanto Plain. A full redescription of the male is given based on the examination of the specimens collected. The change of the genus for the present species to belong to was proposed based on the fact that the morphological characteristics of the males are different from those of the genus *Neobisium*, being consistent with those of the *Microbisium*.

Introduction

Chamberlin (1930) divided the genus *Obisium* into *Microbisium* and *Neobisium*, based on the difference that *Neobisium* possesses 4 and 8 tactile setae on movable and fixed fingers of the chela, respectively, but *Microbisium* has only 3 and 7 tactile setae. However, those characteristics of the *Microbisium* correspond to those of tritonymphs of the *Neobisium* spp. To make sure the genus *Microbisium*, it is required to distinguish between tritonymphs of *Neobisium* and adults of *Microbisium* itself. *Neobisium* (*Parobisium*) *pygmaeum* is one of the problematic pseudoscorpiones, having been not determined exactly the genus to belong to, and so tentatively included into the genus *Neobisium* (Morikawa, 1960).

As I recently get cues to solve this problem, the present paper reports about it.

Aspects of the problem

In Japan, 4 species of *Neobisium* (*Parobisium*) have been so far recorded, of which *Neobisium* (*Parobisium*) *magnum*, *N.* (*P.*) *flexifemoratum*, and *N.* (*P.*) *anagamidensis* possess the adult characteristics mentioned above (4 and 8 tactile setae on chela). These species are, therefore, surely ones belonging to *Neobisium* (*Parobisium*). However, of *N.* (*P.*) *pygmaeum*, so called "adult" individuals with the above mentioned numbers of setae on chela have never been found. For example, KOBARI (1983) intensively studied this species ecologically, collecting quantitative samples about four times a month throughout 14 consecutive months at the same habitat and examining 273 individuals in total, but he could find no "adult" individuals with 4 and 8 tactile setae on chela, in spite of the vast occurrence of protonymphs. All the oldest individuals obtained then were of tritonymphal forms with 3 and 7 tactile setae on movable and fixed fingers of chela, respectively. He, therefore, vaguely suggested a redesignation of this species to put into the genus *Microbisium* (KOBARI, 1983). However, there was then no evidence that the "tritonymphal" individuals were of the real adult, because there has remained a possibility that "tritonymphal" forms was still immature.

After that, I continued to take samples from other sites to study the ecology of pseudoscorpions in northern districts of the Kanto Plain, central Japan, and recently could collect one female attaching eggs on her ventral side of abdomen (Fig. 1) and 5 males with distinct male genitalia. Examination of these specimens revealed that all the individuals clearly possess only 3 and 7 tactile setae on fingers of chela. Therefore, it can be concluded that the "tritonymphal stage" of this species is the real adult. In the following, the male is described and a debate on the taxonomic status of this species is presented.

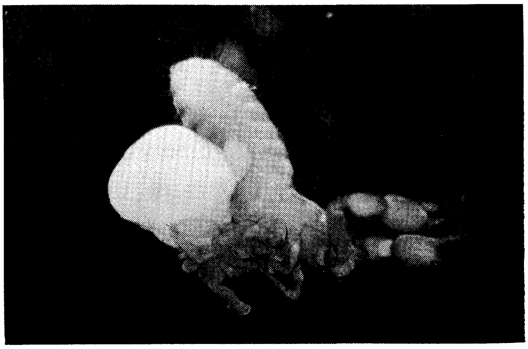

Fig. 1. Photo of a female with eggs of *Microbisium pygmaeum* (ELLINGSEN).

Redescription of the male of *Neobisium* (*Parobisium*) *pygmaeum* (Ellingsen)

Materials examined: ♂, Inuzuka, Sekijo-machi, Makabe-gun, Ibaraki Pref., 18-X-1978, K. Koya leg., from soil sample of a bamboo forest, through Tullgren funnel; 3♂♂, Isagahara, Ninomiya-machi, Shimotsuka-gun, Tochigi Pref., 20-XII-1980, H. Kobari leg., from soil sample of a *Cryptomelia japonica* forest, through Tullgren funnel; ♂, Arai-shinden, Akeno-machi, Makabe-gun, Ibaraki Pref., 19-II-1981, H. Kobari leg., from soil sample of a deciduous forest, through Tullgren funnel. All the specimens examined are deposited in my collection.

Characteristics: Body length 1.19-1.37 mm. Carapace a little longer than broad; derm smooth; chaetotaxy 4-6, 22; and epistomal process present (Fig. 2-A). Two pair of eyes, anterior pair being about two ocular diameters apart from anterior carapacial margin, and posterior pair about one-third ocular diameters apart from the anterior pair.

Abdomen oval, 0.83-1.01 mm in length; width longer than width of carapace. Pleural membrane granulated (Fig. 2-B). Tergites and sternites entirely smooth, with chaetotaxy as in Fig. 2-C and D and Table 1. Dorsal segments all with setae in a single row; each of the ventral segments except genital area also commonly with a row of setae, but ventral segments VI-VIII each with two additional minute setae near median line, distinctly jutted out anteriorly from the row of setae. Coxal area in Fig. 3-A; three long setae deposited on manducatory process of maxilla, a long seta on ante-apical portion of ventral maxillary disc near median line, and 4-6 and 4-7 short setae on maxillary disc and on each coxa, respectively. External and internal structures of genitalia as in Fig. 2-E and F, respectively.

Chelicera (Fig. 3-B) 0.17-0.19 mm long and 0.12-0.14 mm wide; movable finger 0.14-0.15 mm long, with 11-14 acute teeth (Table 2), galea absent and represented by a tiny sclerotic hump on apex of movable finger, galeal seta situated at about 1/3 from the apex; palm with 5 setae; fixed finger with 14-15 teeth (Table 2); flagellum with about 7 blades, at least the first 5 being serrated.

Pedipalp as in Fig. 3-C. Surface of each palpal podomere smooth, without granules. Palpal proportion (length-breadth ratio) as follow: trochanter 1.64-1.82, femur 2.73-3.10, tibia 1.79-2.00 and chela 2.58-2.72. Chaetotaxy of chela as in Fig. 3-D; fixed and movable fingers with 31-34 and 34-37 teeth, respectively,

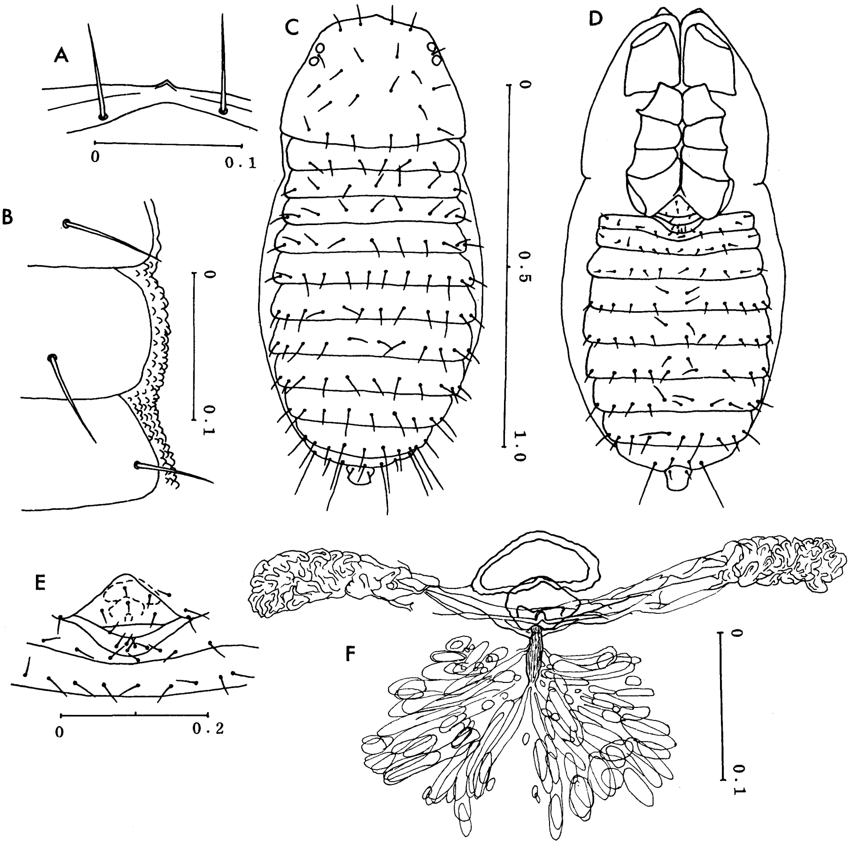

Fig. 2. *Micrcbisium pygmaeum* (ELLINGSEN) (male). A : epistomal process, B : pleural membrane and tergite I and II, C : dorsal aspect and chaetotaxy, D : ventral aspect and chaetotaxy, E : external structure of genitalia, and F : internal structure of genitalia with uterus masculinus internus, lateral genital sacs and accessory glands.

these teeth densely covering the entire internal margins of both fingers (Table 2).

Subterminal tarsal setae on each leg bifurcated (Fig. 3-E).

Measurements of various body parts of the males are given in Table 3.

Remarks: The male of this species is comparable with that of *Microbisium confusum* HOFF, from north America, but the former differs from the latter in the chaetotaxy of carapace, length-breadth ratio of palpal femur, and the number of the flagellum. All the males were collected during cool and cold seasons (from October to February).

Table 1. The number of setae deposited on various structures of males of *Microbisium pygmaeum* (ELLINGSEN).

Setae on body parts	Locality, Specimen No.	Inuzuka 78101802	Isagahara 80122007	Isagahara 80122015	Isagahara 80122017	Araishinden 81021906
Chela	Trichobothria of movable finger	3	3	3	3	3
	Trichobothria of fixed finger	7	7	7	7	7
Chelicera	Movable finger	1	1	1	1	1
	Fixed finger	5	5	5	5	5
Carapace	Anterior row	4	4	4	4	4
	Ocular row	4	4	4	4	4
	Median & intermedian row	8	8	8	8	8
	Posterior row	6	6	6	6	5
	Total setae	22	22	22	22	21
Coxal area (Left/Right)	Manducatory process	3/3	3/3	3/3	3/3	3/3
	Maxilla (long seta) - (short setae)	1-5/1-4	1-5/1-5	1-6/1-5	1-5/1-5	1-5/1-5
	Coxa I	4/6	5/5	6/6	5/5	5/5
	Coxa II	5/5	5/5	5/4	6/5	5/5
	Coxa III	6/5	5/5	5/6	4/4	5/4
	Coxa IV	6/6	7/6	6/6	6/7	7/6
Tergite	I	6	7	6	6	6
	II	7	7	7	8	7
	III	9	10	10	10	11
	IV	10	9	11	10	9
	V	12	10	11	11	11
	VI	12	12	11	13	9
	VII	11	11	12	12	10
	VIII	11	10	11	11	10
	IX	9	9	9	10	9
	X	10	9	9	9	9
	XI	7	9	8	7	7
	XII	2	2	2	2	2
Sternite	II & III (setae around genitalia) - (posterior row)	11-10	18-14	15-14	16-13	15-13
	IV	12	10	12	14	13
	V	10	12	11	12	12
	VI (anterior row) - (posterior row)	2-11	2-11	2-11	2-10	2-12
	VII (〃) - (〃)	2-11	2-11	2-12	2-10	2-11
	VIII (〃) - (〃)	2-9	2-12	2-11	2-11	2-11
	IX	11	11	12	13	11
	X	10	10	11	10	11
	XI	4	3	4	4	4
	XII	2	2	2	2	2

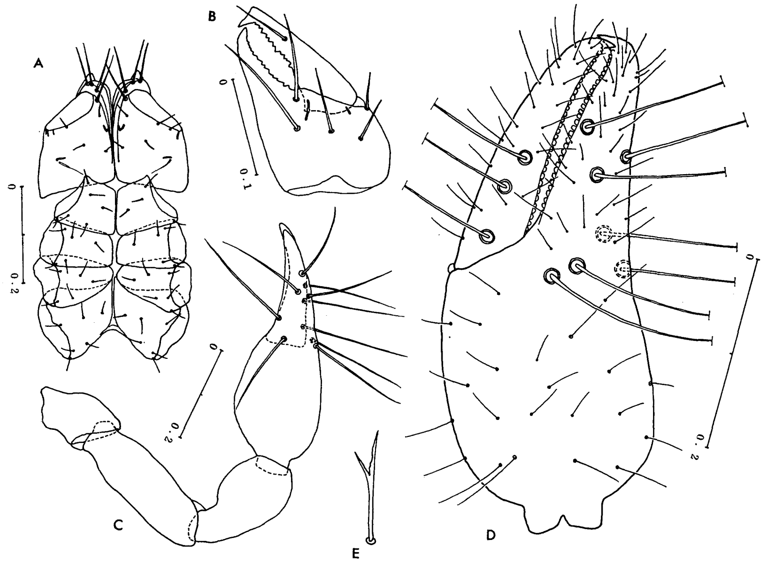

Fig. 3. *Microbisium pygmaeum* (ELLINGSEN) (male). A : coxal enlargement and chaetotaxy, B : chelicera excluding serrula and flagellum, C : pedipalp, D : lateral aspect of left chela, and E : subterminal tarsal seta.

Table 2. The teeth number of chelae and chelicerae of males of *Microbisium pygmaeum* (ELLINGSEN).

		Locality, Specimen No.	Inuzuka 78101802	Isagahara 80122007	Isagahara 80122015	Isagahara 80122017	Araishinden 81021906	mean
Chela	Left	movable finger	35	34	37	34	37	35.4
		fixed finger	32	32	31	31	33	31.8
	Right	movable finger	•	36	35	34	36	35.3
		fixed finger	•	32	32	31	34	32.3
Chelicera	Left	movable finger	14	13	12	11	13	12.6
		fixed finger	16	18	14	13	16	15.4
	Right	movable finger	11	12	12	12	13	12.0
		fixed finger	14	15	15	10	17	14.2

Table 3. Measurements (in mm) of various body parts of males of *Microbisium pygmaeum* (ELLINGSEN) according to CHAMBERLIN's criteria (CHAMBERLIN, 1931). L : length, B : breadth.

Body parts			Locality, Specimen No.	Inuzuka 78101802	Isagahara 80122007	Isagahara 80122015	Isagahara 80122017	Araishinden 81021906	Mean
Body L				1.25	1.37	1.19	1.19	1.35	1.25
Carapace		L		0.37	0.39	0.36	0.36	0.34	0.36
		Anterior B		0.30	0.31	0.29	0.30	0.31	0.30
		B between eyes		0.31	0.33	0.31	0.32	0.33	0.32
Abdomen				0.88	0.98	0.83	0.83	1.01	0.91
Pedipalp	Chela	Total L		0.51	0.52	0.49	0.49	0.51	0.50
		L of palm		0.23	0.27	0.24	0.26	0.26	0.25
		L of movable finger		0.27	0.29	0.28	0.28	0.29	0.28
		B of palm		0.19	0.20	0.18	0.19	0.19	0.19
		Total L/B of palm		2.68	2.60	2.72	2.58	2.68	2.65
	Tibia	L		0.25	0.28	0.26	0.25	0.26	0.26
		B		0.14	0.15	0.13	0.14	0.13	0.14
		Proportion L/B		1.79	1.87	2.00	1.79	2.00	1.89
	Femur	L		0.31	0.32	0.30	0.30	0.31	0.31
		B		0.10	0.11	0.10	0.11	0.11	0.11
		Proportion L/B		3.10	2.91	3.00	2.73	2.82	2.91
	Trochanter	L		0.20	0.19	0.19	0.18	0.19	0.19
		B		0.11	0.11	0.11	0.11	0.11	0.11
		Proportion L/B		1.82	1.73	1.73	1.64	1.73	1.73
Chelicera		L		0.17	0.19	0.18	0.18	0.18	0.18
		B		0.13	0.14	0.12	0.12	0.13	0.13
		L of movable finger		0.14	0.15	0.14	0.14	0.15	0.14
Leg I		Femur I	L	0.14	0.16	0.15	0.16	0.15	0.15
			B	0.05	0.07	0.06	0.06	0.06	0.06
		Femur II	L	0.10	0.12	0.11	0.10	0.11	0.11
			B	0.05	0.05	0.05	0.05	0.05	0.05
		Tibia	L	0.12	0.14	0.11	0.13	0.14	0.12
			B	0.04	0.04	0.04	0.04	0.04	0.04
		Metatarsus	L	0.07	0.07	0.07	0.07	0.07	0.07
			B	0.04	0.04	0.04	0.04	0.05	0.04
		Tarsus	L	0.12	0.13	0.12	0.12	0.12	0.12
			B	0.04	0.04	0.04	0.04	0.04	0.04
Leg IV		Femur I	L	0.15	0.16	0.14	0.14	0.15	0.15
			B	0.10	0.10	0.09	0.10	0.09	0.10
		Femur II	L	0.15	0.18	0.15	0.16	0.16	0.16
			B	0.09	0.09	0.09	0.09	0.09	0.09
		Tibia	L	0.23	0.25	0.23	0.23	0.23	0.23
			B	0.06	0.06	0.06	0.05	0.06	0.06
		Metatarsus	L	0.09	0.09	0.09	0.09	0.09	0.09
			B	0.06	0.05	0.04	0.05	0.05	0.05
		Tarsus	L	0.15	0.17	0.16	0.15	0.16	0.16
			B	0.05	0.04	0.04	0.04	0.04	0.04

Taxonomic consideration

1. Historical relationship between *Neobisium* and *Microbisium*

CHAMBERLIN (1930), who erected the genus *Microbisium* based on the criterion noted in introduction, doubted the presence of males in the genus and speculated parthenogenetic reproduction. Subsequently, HOFF (1944, '46, '56, '61) intensively studied this genus, but did not get any males. GABBUTT (1969) omitted *Microbisium dumicola* (C.L. KOCH) or *Neobisium sylvaticum* (C.L. KOCH) from his paper, stating that adults of *N. sylvaticum* have never been recorded from any parts of the British Isles. WEYGOLDT (1969) noted that "Nothing is known about the development of *Microbisium* spp., the number of their post-embryonic insters, or their molts; the adults may be neotenic tritonymphs. This can lead to confusion, for *Microbisium dumicola* has been identified as the tritonymph of *Neobisium sylvaticum*". LAWSON (1969) first found and described a male of *M. confusum*, and noted that it was extremely similar in morphology to the tritonymph of the genus *Neobisium*, suggesting the possibility of the presence of males in other species of the genus *Microbisium*. In U.S.A., there are, at present, three species belonging to the genus *Microbisium*: *M. confusum* HOFF, *M. parvulum* (BANKS) and *M. brunneum* (HAGEN) (LAWSON, 1969). Recently, NELSON (1982) gave detailed descriptions of all the stages of *M. confusum*.

In Japan, *Neobisium* (*Parobisium*) *pygmaeum* (ELLINGSEN, 1907) is known as one of the commonest soil-dwelling pseudoscorpions in central and northern regions. It was originally described as *Obisium pygmaeum* by ELLINGSEN in 1907, based on the specimens collected in Negishi-mura, Yokohama, central Japan. BEIER (1932) put the species into the genus *Microbisium*. Subsequently, MORIKAWA (1952) briefly described the male of this species as *Microbisium pygmaeum*. But MORIKAWA (1960) changed it to *Neobisium* (*Parobisium*) *pygmaeum* with a proviso of "nymphal and undecided species". After that, this species has been treated as *N.* (*P.*) *pygmaeum* in some ecological works (SATO, 1983; ISHII & KATO, 1981; KOBARI, 1983).

2. Taxonomic status of the present species

In a previous paper (KOBARI, 1983), it was pointed out that "adults", which should possess 4 and 8 tactile setae on movable and fixed fingers of chela, respectively, were never collected in spite of the vast occurrence of protonymphs. Further, it was assumed that such typical "adults" might be entirely absent ir the population, and that the "tritonymphs" might be actually adults responsible for the production of protonymphs.

As redescribed above, each of the present five male specimens possessed distinct male genitalia, though having the tritonymphal number of tactile setae on chelal finger. On the other hand, as noted in Aspect of the Problem, a female with eggs have also just the tritonymphal number of tactile setae. In *Neobisium* spp., the male genitalia are not seen in tritonymphs but only on adults. These indicate that the "tritonymph" of *N.* (*P.*) *pygmaeum* is the actual adult responsible for the reproduction. The present species should, therefore, be treated as *Microbisium pygmaeum* not as *Neobisium* (*Parobisium*) *pygmaeum.*

Based on the above, *Neobisium* (*Parobisium*) *pygmaeum* is redesignated as *Microbisium pygmaeum.*

Microbisium pygmaeum (ELLINGSEN), 1907 redesignation
Obisium pygmaeum ELLINGSEN, 1907, p. 12.
Microbisium pygmaeum; BEIER, 1932, p. 140.
Neobisium (*Parobisium*) *pygmaeum*; MORIKAWA, 1960, p. 144.

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摘　　要

小針　廣（土浦第三高等学校，〒300 茨城県土浦市大岩田町 1599）：チビコケカニムシの雄の再記載と属の変更について。

関東平野の北部で採集された5個体のチビコケカニムシ *Neobisium* (*Parobisium*) *pygmaeum* の雄をもとに，雄の再記載を行なった。さらに，この雄の形態上の特徴は *Neobisium* 属のものとは異なり，*Microbisium* 属のものであったので属の変更を提案した。

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